Claims

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A piston cooling spray jet and installation tool there for comprising:

a piston cooling nozzle, the nozzle having a hollow main body portion adapted to be press fit into a through bore of an engine cylinder block, a first end of the through bore located in a piston gallery and a second end of the through bore located in a main bearing journal, the through bore intersecting with an oil circuit in the cylinder block, a nozzle tube affixed thereto so that the nozzle tube is in fluid communication with a partially threaded interior passage in the hollow main body portion and with the oil circuit when the main body portion is mounted in the cylinder block, the main body portion of the nozzle further having an orientation feature;

an installation tool comprising a main body portion adapted to mateably engage a surface of the main bearing journal, a cap screw extending through an aperture in the main body portion, and an orientation key affixed to the main body portion and partially surrounding the cap screw;

wherein the nozzle is inserted into the through bore from a first side in the piston gallery and the installation tool is inserted in the through bore from a second side in the main bearing journal such that the main body portion of the installation tool mateably engages the surface of the main bearing journal while the cap screw and orientation key are received in the through bore; the cap screw is threaded into the interior passage of the main body portion of the nozzle and the orientation key of the installation tool mateably engages the orientation feature of the nozzle so that when the cap screw is tightened to a predetermined torque the nozzle is pulled into the through bore to a predetermined depth and at a predetermined orientation.

2. A cooling nozzle mounting arrangement comprising:

an internal combustion engine cylinder block having:

at least one piston gallery wherein a piston cylinder is located;

at least one main bearing journal;

an oil circuit; and,

a through bore provided in the cylinder block having a first end located in the piston gallery and a second end located in the main bearing journal, the through bore intersecting with the oil circuit;

a cooling nozzle comprising:

a main body cartridge having a generally cylindrical portion with an interior passage located therein and an orientation feature extending from the cylindrical portion, the orientation feature being a semi-cylinder, the interior passage of the main body cartridge having threads at an end proximal to the orientation feature, the outside diameter of the cylindrical portion of the main body cartridge being selected to attain an appropriate press fit with the through bore; and,

a nozzle tube having a first end and a second end affixed to the main body cartridge so that the tube is in communication with the interior passage thereof;

an installation tool comprising:

a main body portion having an aperture therein and having upper surfaces having a radius that matches a radius of the main bearing journal;

an orientation key mounted in the aperture of the main body portion, the orientation key having a cylindrical portion with an interior bore and a semi-cylindrical portion; and,

a cap screw having a threaded end and a head end, the cap screw being inserted in the orientation key bore from a lower side of the main body portion such that the threaded end extends out from the semi-cylindrical portion of the orientation key and the head is seated against a surface on a lower side of the main body portion, the interior bore of the orientation key being sized so that the cap screw can turn freely when disposed in the bore;

wherein the main body cartridge of the nozzle is started in the through bore at the first end located in the piston gallery, the orientation key and cap screw are inserted in the second end of the through bore in the main bearing journal, the radius of the upper surfaces of the main body portion of the tool are brought into mating engagement with the radius of the main bearing journal, the cap screw is started in

the threads of the interior passage of the nozzle, as the cap screw is torqued the main body cartridge of the nozzle is drawn into a press fit with the through bore, the orientation key of the tool being rigidly affixed to the main body portion and the semi-cylindrical portion of the key is matingly opposed by the semi-cylindrical orientation feature of the nozzle, so that the nozzle cannot rotate in the bore as the cap screw is torqued, and the second end of the through bore is sealed against oil leaks from the oil circuit intersecting the through bore when a main bearing is mounted in the main bearing journal.

3. A cooling nozzle mounting arrangement according to claim 2 wherein the nozzle tube has a serpentine profile.

4. A cooling nozzle mounting arrangement according to claim 2 wherein the first end of the nozzle tube is adapted to provide a predetermined spray pattern.

5. A cooling nozzle mounting arrangement according to claim 2 wherein first and second sides of the main body portion of the tool are parallel to first and second sides of the main bearing journal when the radiused upper surfaces of the main body portion is mated to the main bearing journal.

6. A cooling nozzle mounting arrangement according to claim 2 wherein the precise orientation of both the orientation key of the tool and the orientation feature of the nozzle are pre-selected based upon the desired final orientation of the nozzle within the piston gallery.

7. A cooling nozzle comprising:

a main body cartridge having a generally cylindrical portion with an interior passage located therein and an orientation feature extending from the cylindrical portion, the orientation feature being a semi-cylinder, the interior passage of the main body cartridge having threads at an end proximal to the orientation feature, the outside diameter of the cylindrical portion of the main body cartridge

being selected to attain an appropriate press fit with the through bore; and,

a nozzle tube having a first end and a second end affixed to the main body cartridge so that the tube is in communication with the interior passage thereof.

8. A cooling nozzle according to claim 7 wherein the nozzle tube has a serpentine profile.

9. A cooling nozzle according to claim 7 wherein the first end of the nozzle tube is adapted to provide a predetermined spray pattern.

10. An installation tool comprising:

a main body portion having an aperture therein and having an upper surface having a radius that matches a radius of the main bearing journal;

an orientation key mounted in the aperture of the main body portion, the orientation key having a cylindrical portion with an interior bore and a semi-cylindrical portion;

a cap screw having a threaded end and a head end, the cap screw being inserted in the orientation key bore from a lower side of the main body portion such that the threaded end extends out from the semi-cylindrical portion of the orientation key and the head is seated against a surface on a lower side of the main body portion, the interior bore of the orientation key being sized so that the cap screw can turn freely when disposed in the bore.

11. A method of mounting a piston cooling nozzle in an engine cylinder block comprising the steps of:

providing a through bore in the cylinder block between a piston gallery and a main bearing journal, the through bore intersecting an internal oil circuit of the cylinder block;

inserting a cooling nozzle assembly having an orientation feature in the through bore from the piston gallery;

inserting an installation tool having an orientation key and a cap screw in the

through bore from the main bearing journal

using a radiused upper surface of the installation tool to mateably align the tool with the main bearing journal;

using the orientation feature of the cooling nozzle assembly and orientation key of the installation tool to establish a predetermined orientation of the nozzle within the piston gallery;

threading the cap screw of the installation tool into the cooling nozzle assembly;

tightening the cap screw to a predetermined torque so as to draw the cooling nozzle into a press fit with the through bore at a predetermined depth; and,

unthreading the cap screw from the nozzle assembly and withdrawing the installation tool from the through bore.

12. A method of mounting a piston cooling nozzle in an engine cylinder block according to claim 11 comprising the further step of mounting a main bearing in the main bearing journal so as to seal the through bore at one end thereof.